Innovative Biosolids Management in Austin, Texas

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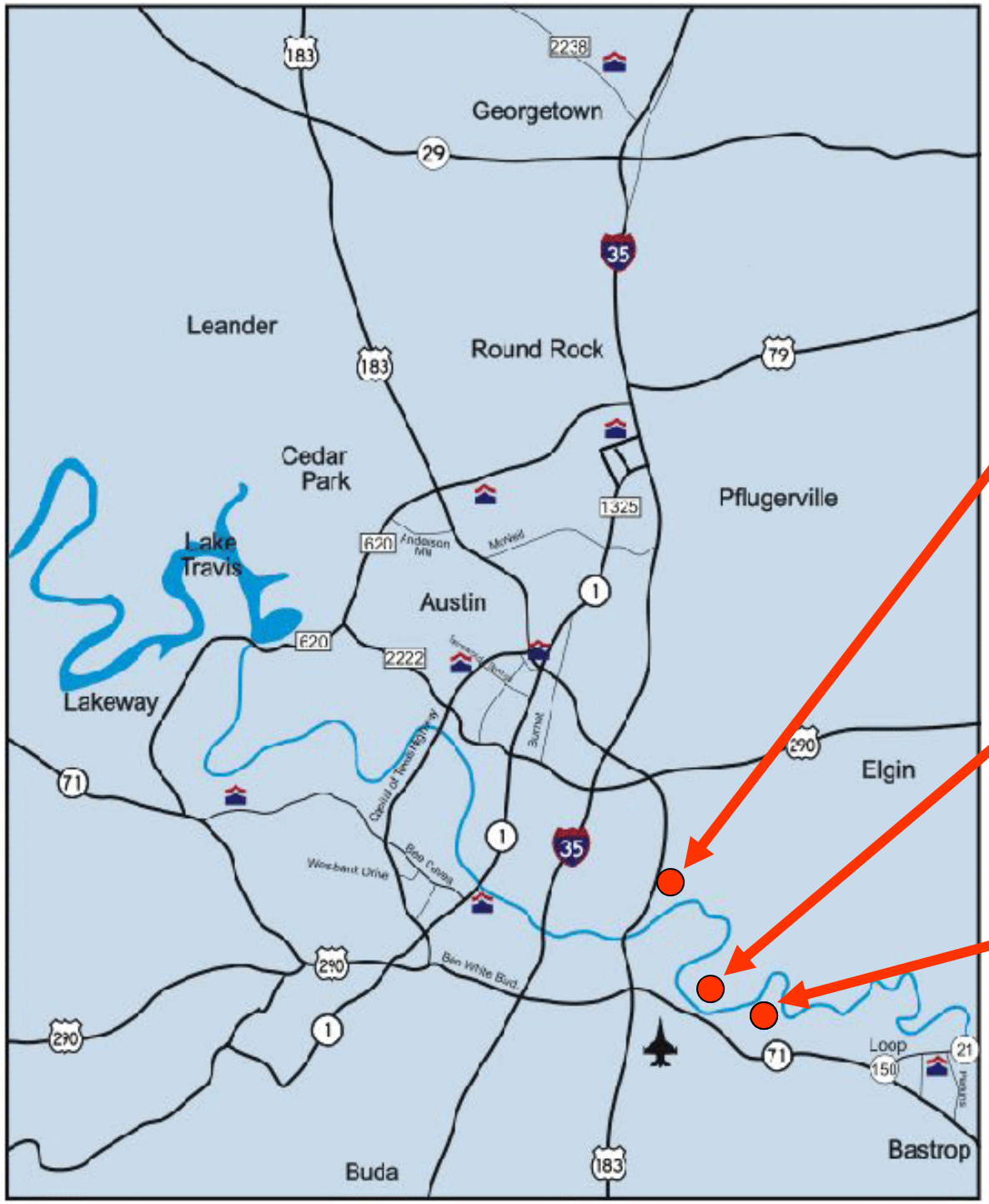
Austin Water, City of Austin, Texas

Acknowledgments

- U.S. Environmental Protection Agency
- Texas Water Development Board
- City of Austin

Presentation Outline

- Background
- Hornsby Bend
- Innovations through the years at Hornsby Bend
- Future of Hornsby Bend
- Questions



Walnut Creek Wastewater Plant (1977)

Hornsby Bend Biosolids Plant (1956)

South Austin Regional Wastewater Plant (1986)

Hornsby Bend
Biosolids Management Plant

Wastewater Treatment Plants

Hornsby Bend

- Urban Waste Recycling
- Conservation
- Research
- Restoration
- Energy Production

More than 40 local, state, regional and National awards

Hornsby Bend Biosolids Management Plant

- City of Austin's central biosolids treatment plant
- City acquired 270 acres in mid-1950s
- Three lagoons to receive sludge:

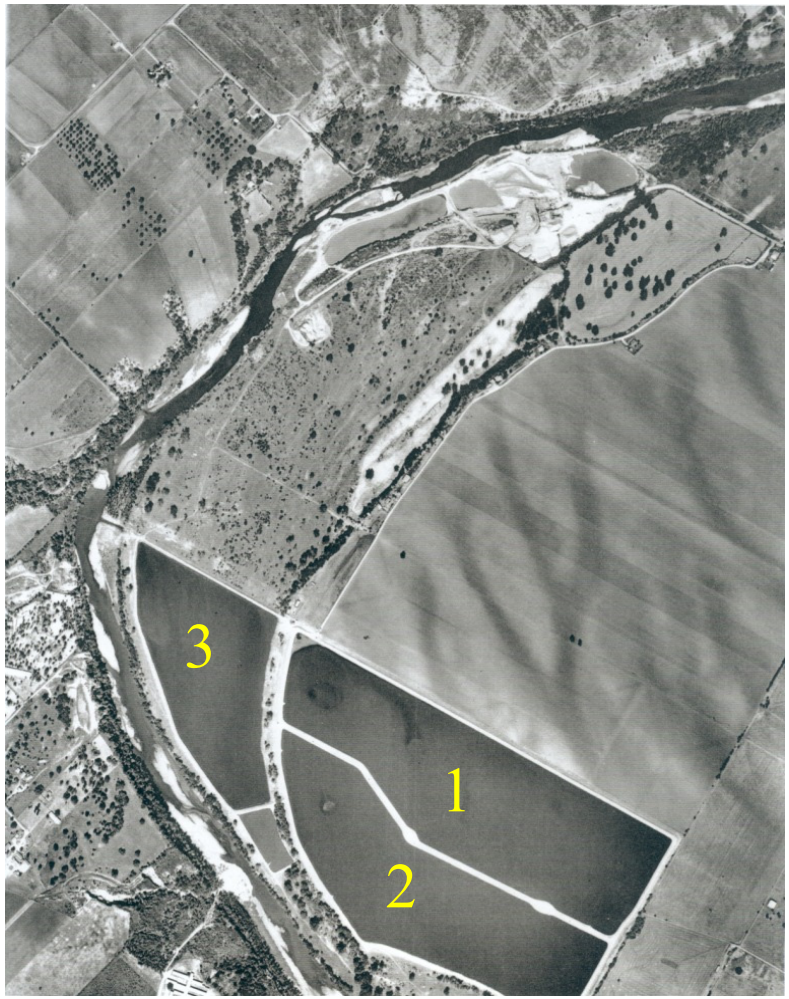
  -Pond 1 – 85 acres

  -Pond 2 – 65 acres

  -Pond 3 – 35 acres

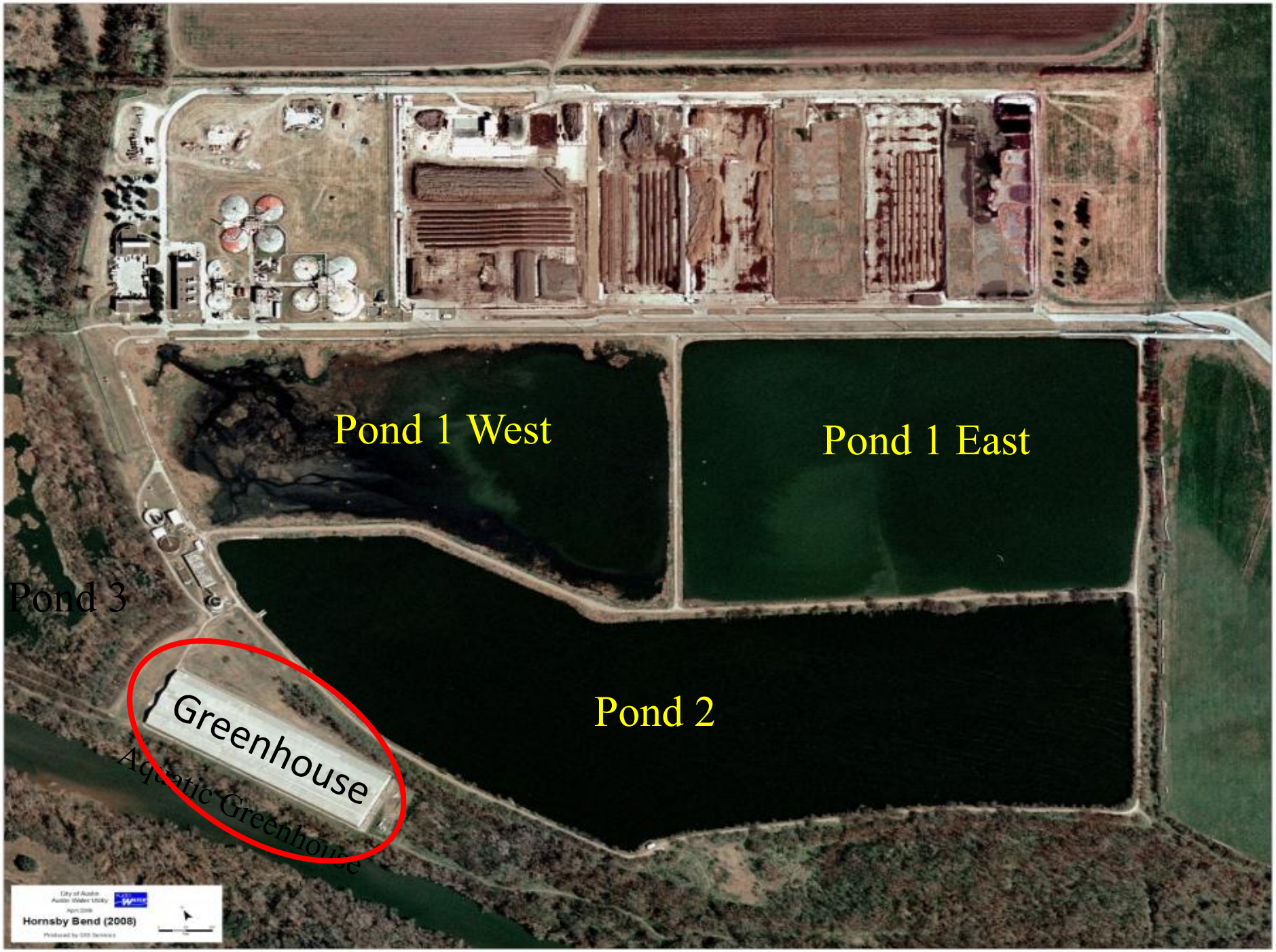
Hornsby Bend Ponds

- Initially designed as “Sludge Oxidation Lakes”
- Permitted as a waste stabilization pond system
- Discharge Permit limits: 30 mg/l BOD_5 and 90 mg/l TSS
- Initially smaller population, lower loading – met permit limits



Hornsby Bend Ponds (continued)

- As population grew, so did the organic loading
- Difficult for pond system to meet permit limits
- Experiments with Water Hyacinths in Pond 4 (5 acres)
- Hyacinths effective in improving effluent quality
- Problems during winter freeze when hyacinths died


Pond 1 West
Pond 1 East
Pond 3
Pond 2
Greenhouse
Aquatic Greenhouse
Hornsby Bend (2008)

Water Hyacinth

- Free-floating, perennial, tropical aquatic plant
- Native to South America
- Fast-growing
- Considered an invasive plant
- Can quickly choke waterways and become a nuisance
- Special permit needed from Texas Parks and Wildlife Dept
- Harvesting is cumbersome

Water Hyacinth

- Extensive root system ideal for filtering solids
- Roots provide sites for attached microbial growth and help in nitrification
- Effective for removal of nutrients, heavy metals, cyanides and a variety of pollutants
- Can be used as bulking agent in composting

Hornsby Bend Ponds (continued)

- 5-acre Greenhouse with 4 acres of ponds constructed to protect hyacinths during winter
- Effective year-round – even in winter
- Rapid growth of hyacinths
- Hyacinth harvesting pain
- Spider mites destroying hyacinths

Hornsby Bend Ponds (continued)

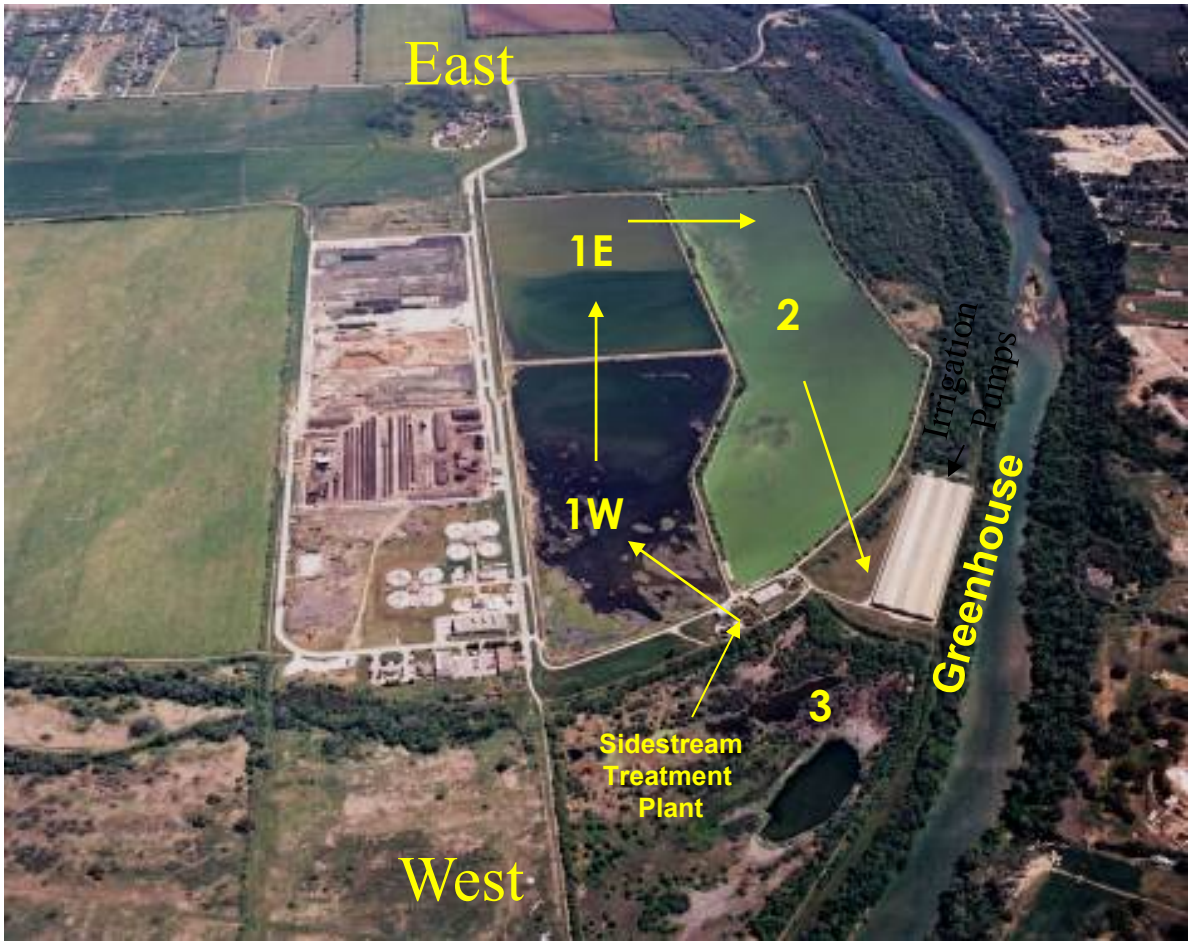
- Replaced hyacinths with Lemna minor (Duckweed) – easier to maintain
- Covers water surface and reduces algae growth
- Provides effective treatment

Ponds - Attract Birds and Birdwatchers

- Most popular birding site in Austin Area
- 370 Bird Species

Pond Treatment System 189 acres

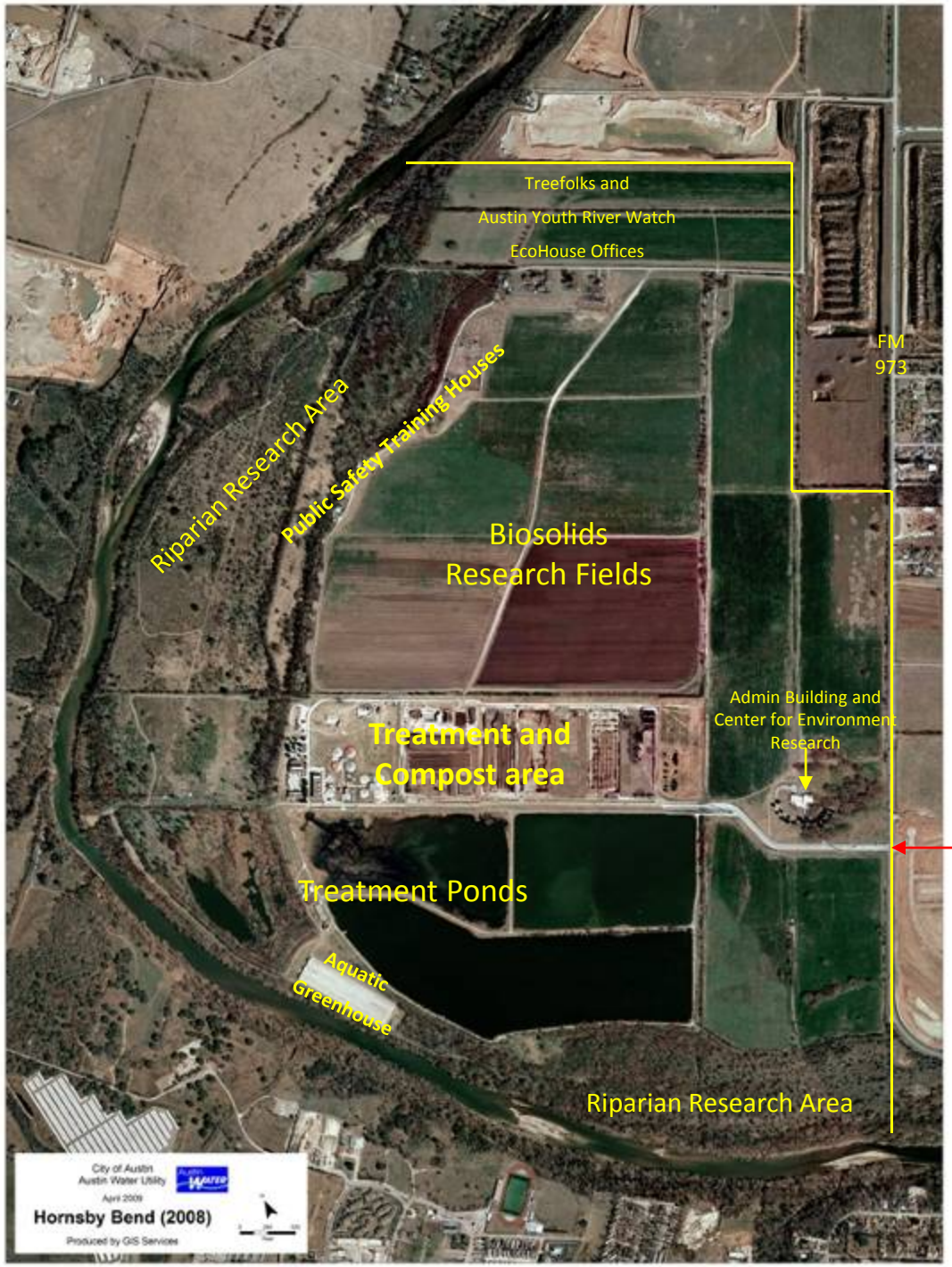
Water moves by gravity
Pond system treats all water
All water recycled – no discharge to river



Aquatic Greenhouse 5 acres

Effluent for on-site agricultural land irrigation
Ponds: 3 cells – 4 acres total
No discharge to the river

Biosolids Management

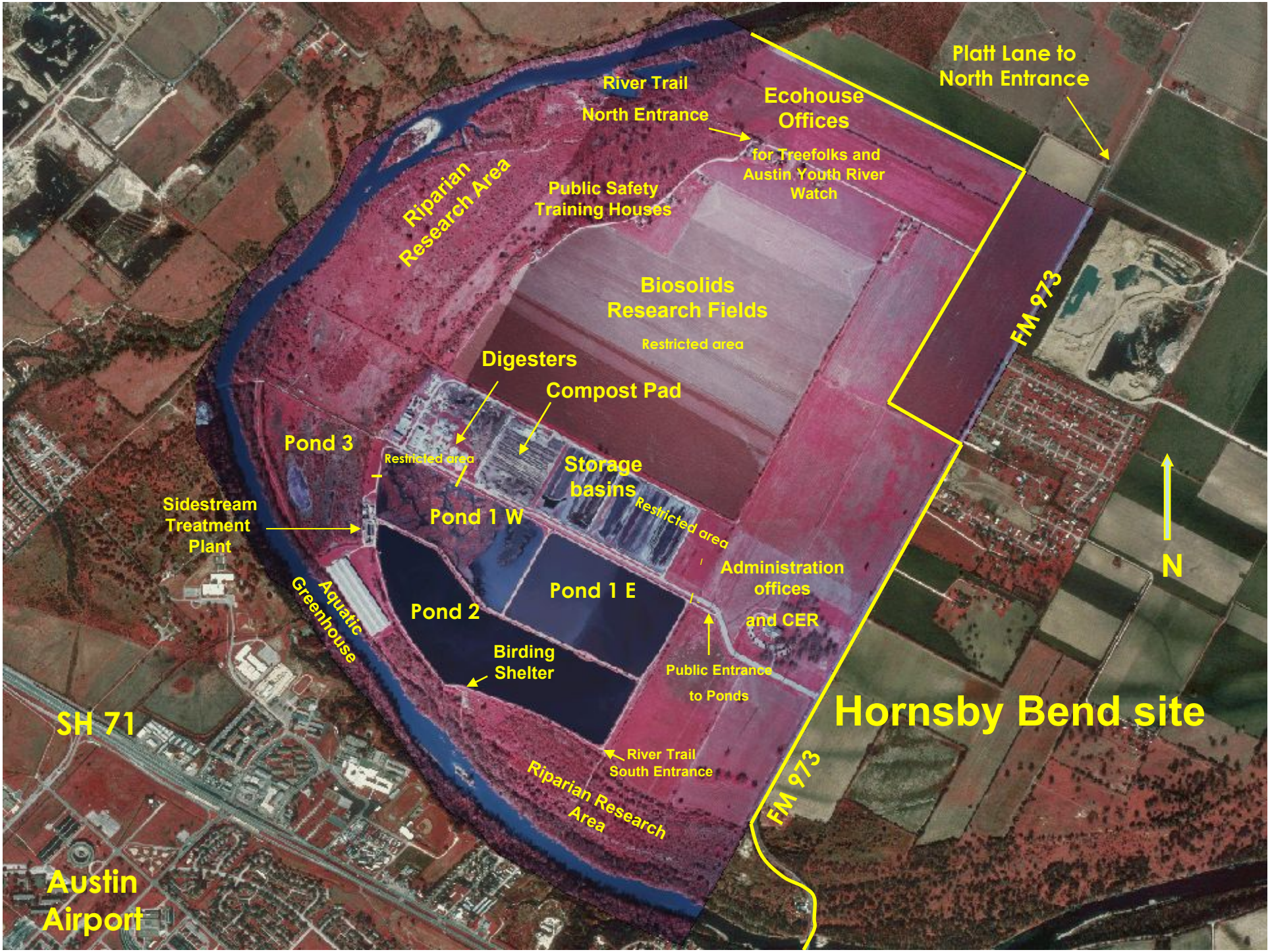


Hornsby Bend Biosolids Management Plant

1200 acres

3.5 miles of

Colorado River


Platt Lane to
North Entrance
River Trail
North Entrance
Ecohouse
Offices
for Treefolks and
Austin Youth River
Watch
Riparian
Research Area
Public Safety
Training Houses
Biosolids
Research Fields
Restricted area
FM 973
Digesters
Compost Pad
Pond 3
Restricted area
Storage
basins
Restricted area
Sidestream
Treatment
Plant
Pond 1 W
N
Administration
offices
and CER
Pond 1 E
Pond 2
Aquatic
Greenhouse
Birding
Shelter
Public Entrance
to Ponds
Hornsby Bend site
SH 71
River Trail
South Entrance
Riparian Research
Area
FM 973
Austin
Airport

All of Austin's Biosolids – 1.5 million gallons per day 98.5% water

Wastewater: 100 MGD

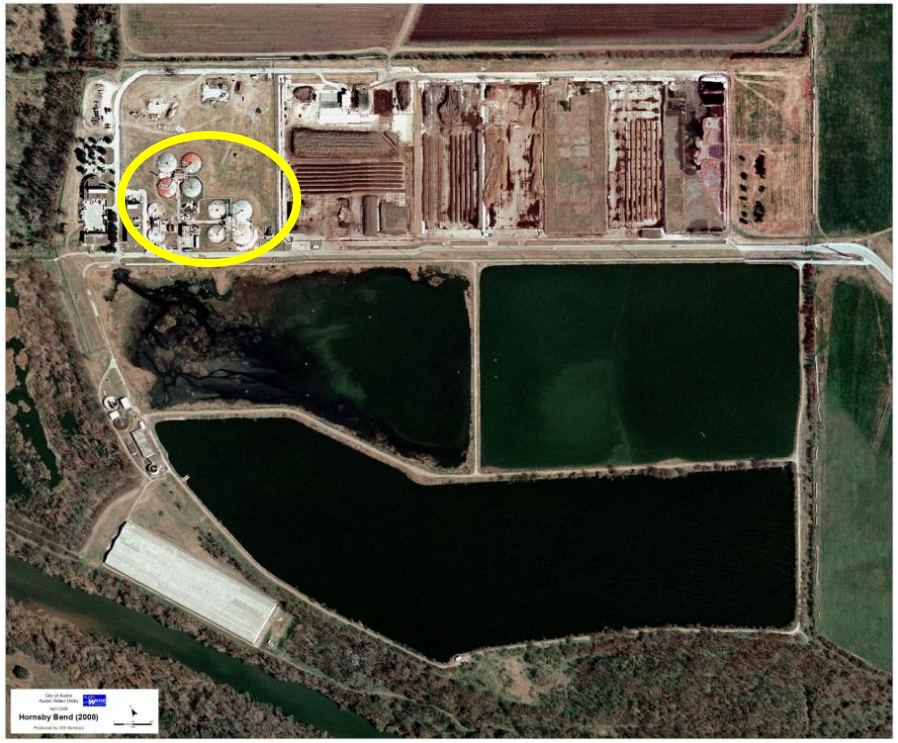
Biosolids: 95 dry tons/day

Walnut Creek Wastewater Treatment Plant

South Austin Regional Wastewater Treatment Plant

Solids – Anaerobic Digesters

- Mesophilic digestion – 98^{o} F
- Approximately 60 days detention time
- 50% solids reduction
- 95% pathogen reduction = Class B
- By-product: Methane



Dewatering

Biosolids

⅔

Biosolids Recycling
First Method
Beneficial Reuse through
Land Application

⅓ on onsite farm – 550 acres
⅓ on offsite farm

⅓

Biosolids Recycling
Second Method
Composting

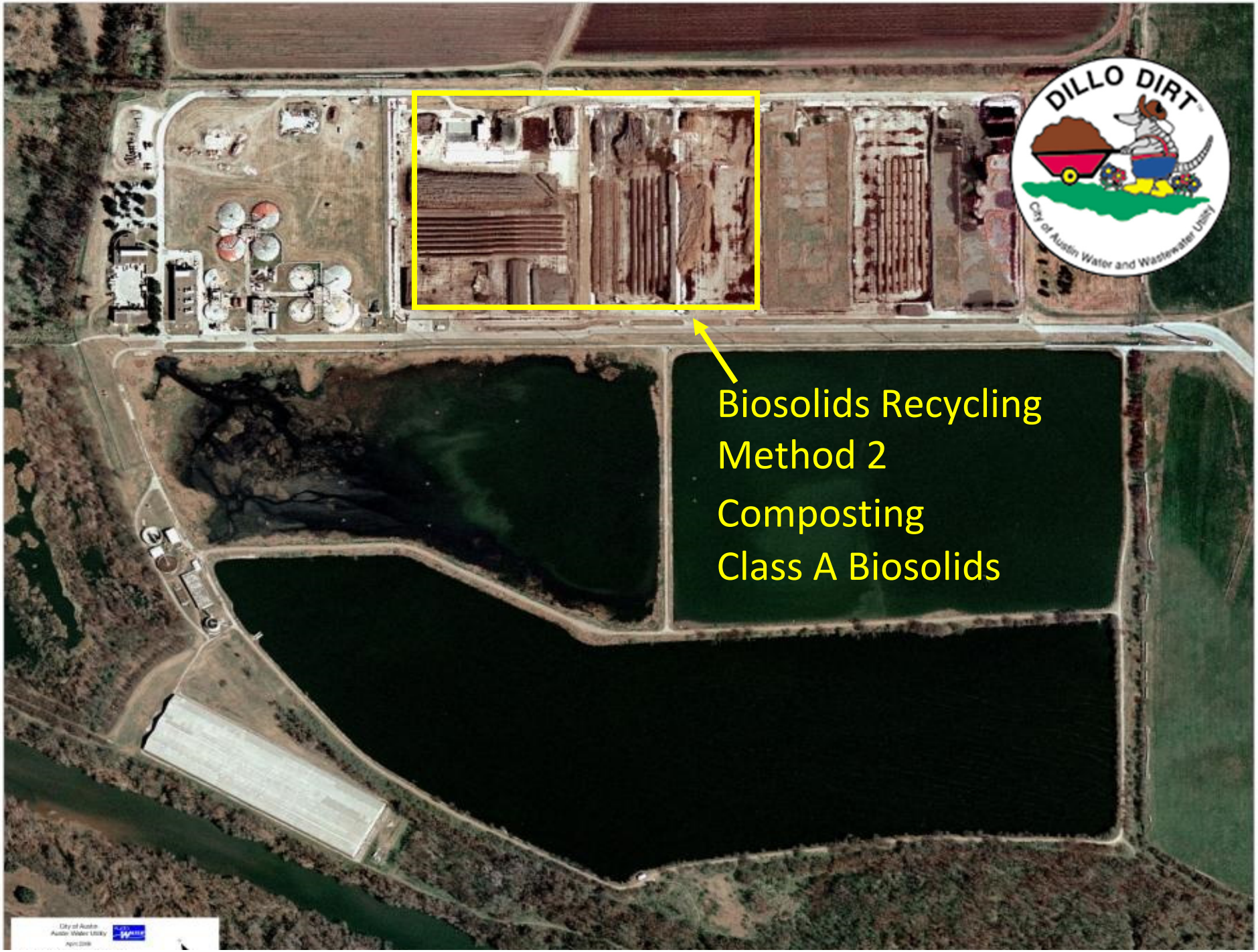
Yard Trimmings and Biosolids

Biosolids Recycling Method 1

Land Application

Class B Biosolids

550 acres of hay fields


DILLO DIRT
City of Austin Water and Wastewater Utility
Biosolids Recycling
Method 2
Composting
Class A Biosolids

Composting

Method 2

Composting

3 parts yard trimmings [carbon]

1 part biosolids [nitrogen/phosphorus]

All of Austin's of yard trimmings:

150,000 yd^3

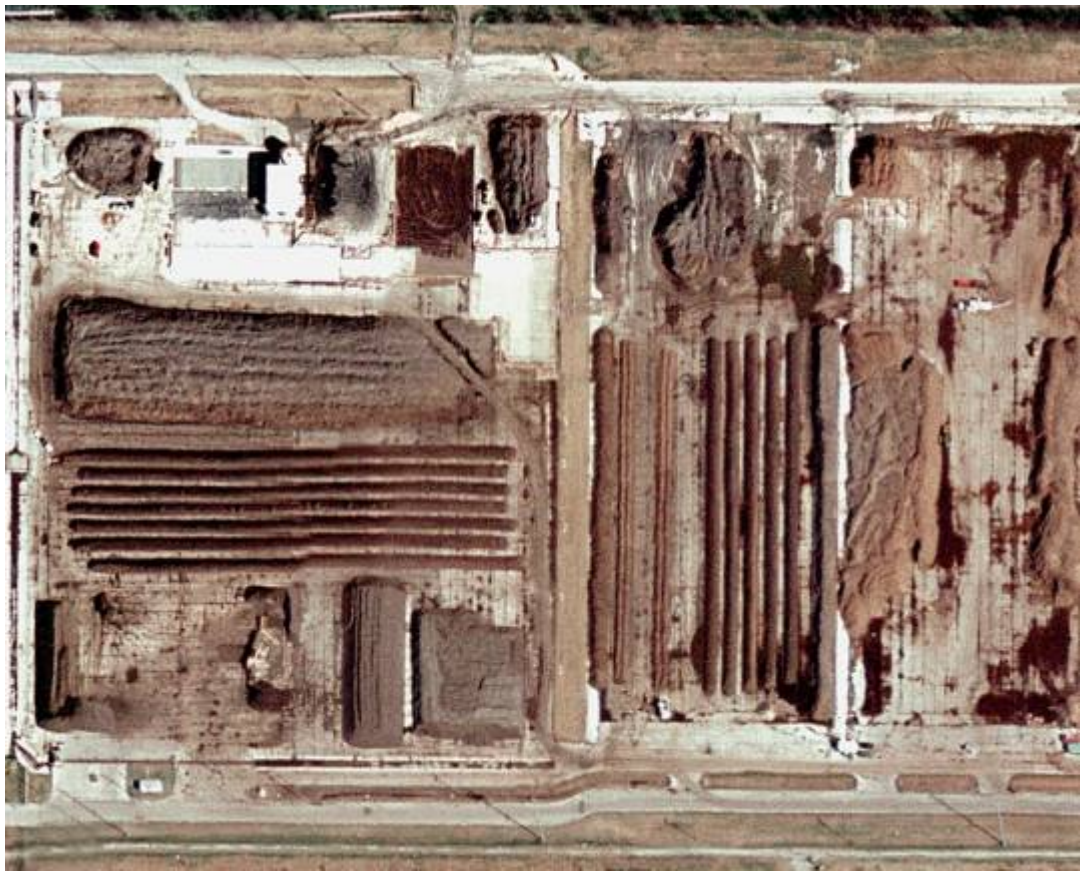
~12% of Austin's solid waste stream

~40% of Austin's recycling stream

Yard Trimmings

Processing

Compost Pad



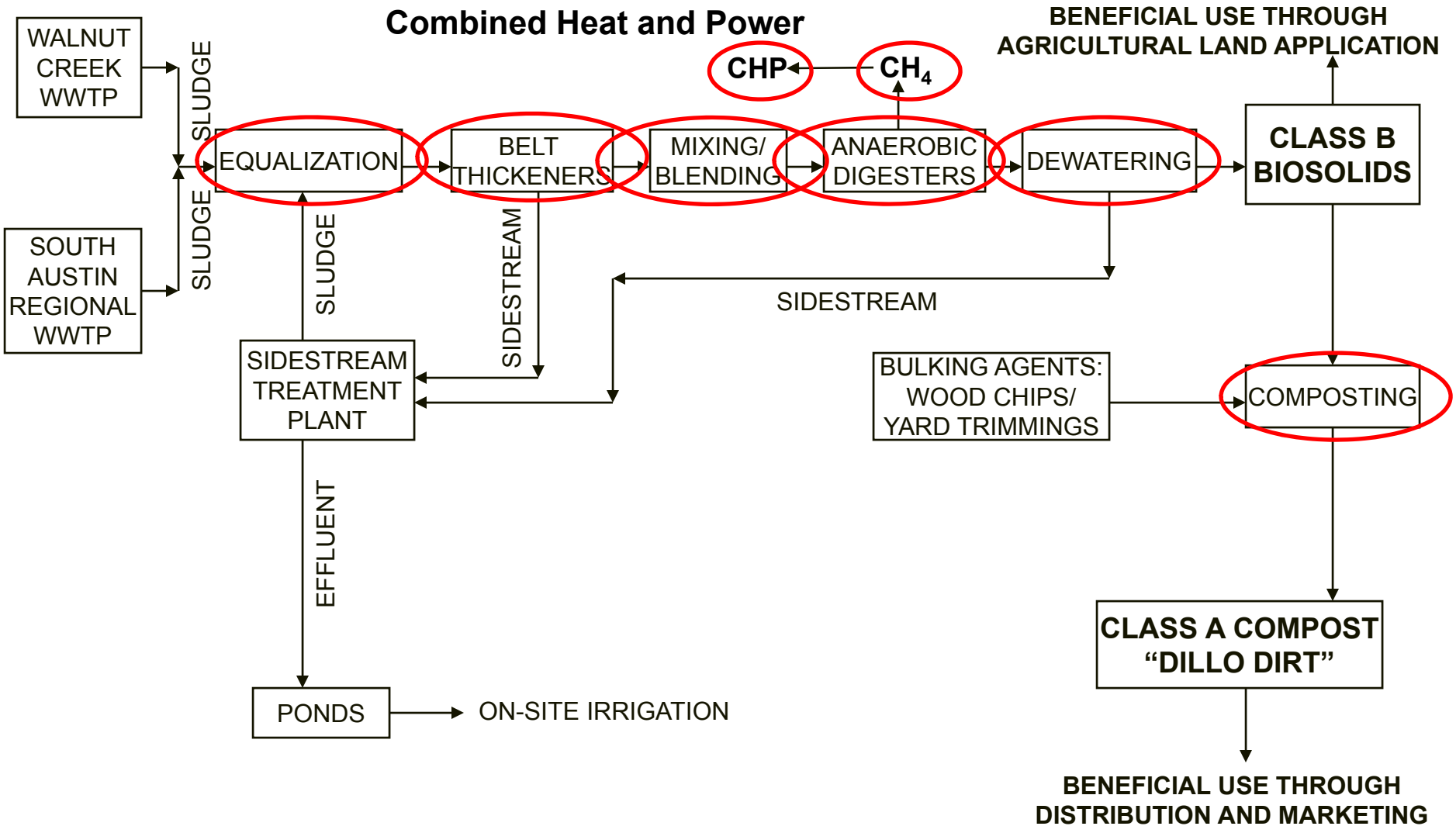
~7,000 tons/year of Class A Compost – "Dillo Dirt"

Clean Water Federal Stimulus Award

- Hornsby Bend ranked #1 in Texas among **"green"** projects
- $31.8 million zero-interest Federal Stimulus Loan

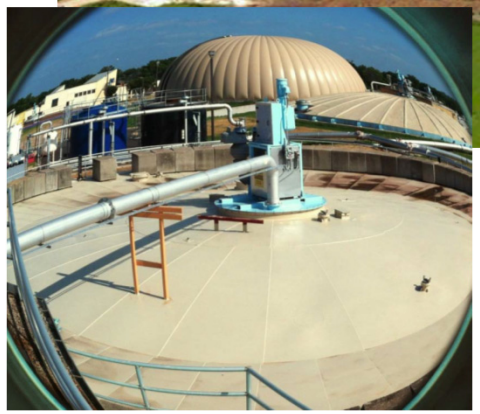
- $30.7 million in interest savings
- 80% of the funds for the **"Green Reserve"** projects through the Texas Clean Water State Revolving Fund

HORNSBY BEND BIOSOLIDS MANAGEMENT PLANT



Two Contracts with Stimulus Funds

1. $6.95 million for Compost Pad expansion
   - Addition of 15-acre compost pad
   - Double composting capacity to use 10,000 dry tons of biosolids per year
2. $27.95 million for digester upgrades and plant-wide efficiency improvements
   - Sludge dewatering improvements – increase capacity, reduce operation cost
   - Digester upgrades – improve process efficiency, increase gas production and capture, reduce use of petroleum-based polymers



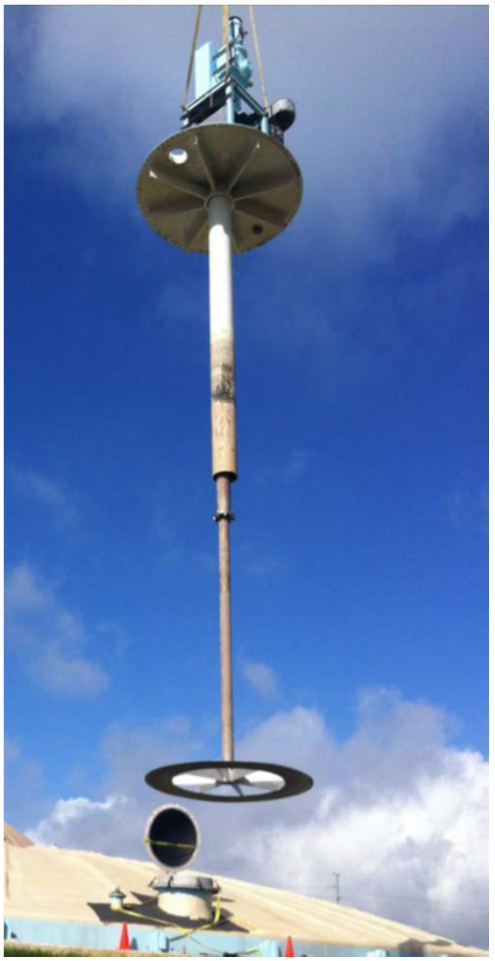
Digester Improvements

- Changed from floating covers to more efficient fixed covers
- Flexible membrane cover for more efficient gas storage
- New 20 HP linear motion mixers in lieu of 100 HP nozzle mix systems

Digester Mixer Replacement

- Before
  - Nozzle Mixers
  - Inadequate Mixing
  - High power use
- After
  - Linear Motion Mixers
  - Better mixing
  - 80% reduction in power use

Nozzle Mixer



Linear Motion Mixer

Benefits of Stimulus Fund Projects

- 560 local jobs over 3 years
- Increase digester gas production
- Compost capacity doubled to produce exceptional quality Class A compost
- Reduce diesel fuel use by 30,000 gallons/year
- 41% reduction in petroleum-based polymers
- Extra 16,000 yd^3/year of yard and tree trimmings used in composting by 2012
- 300 tons of fly ash in concrete for compost pad

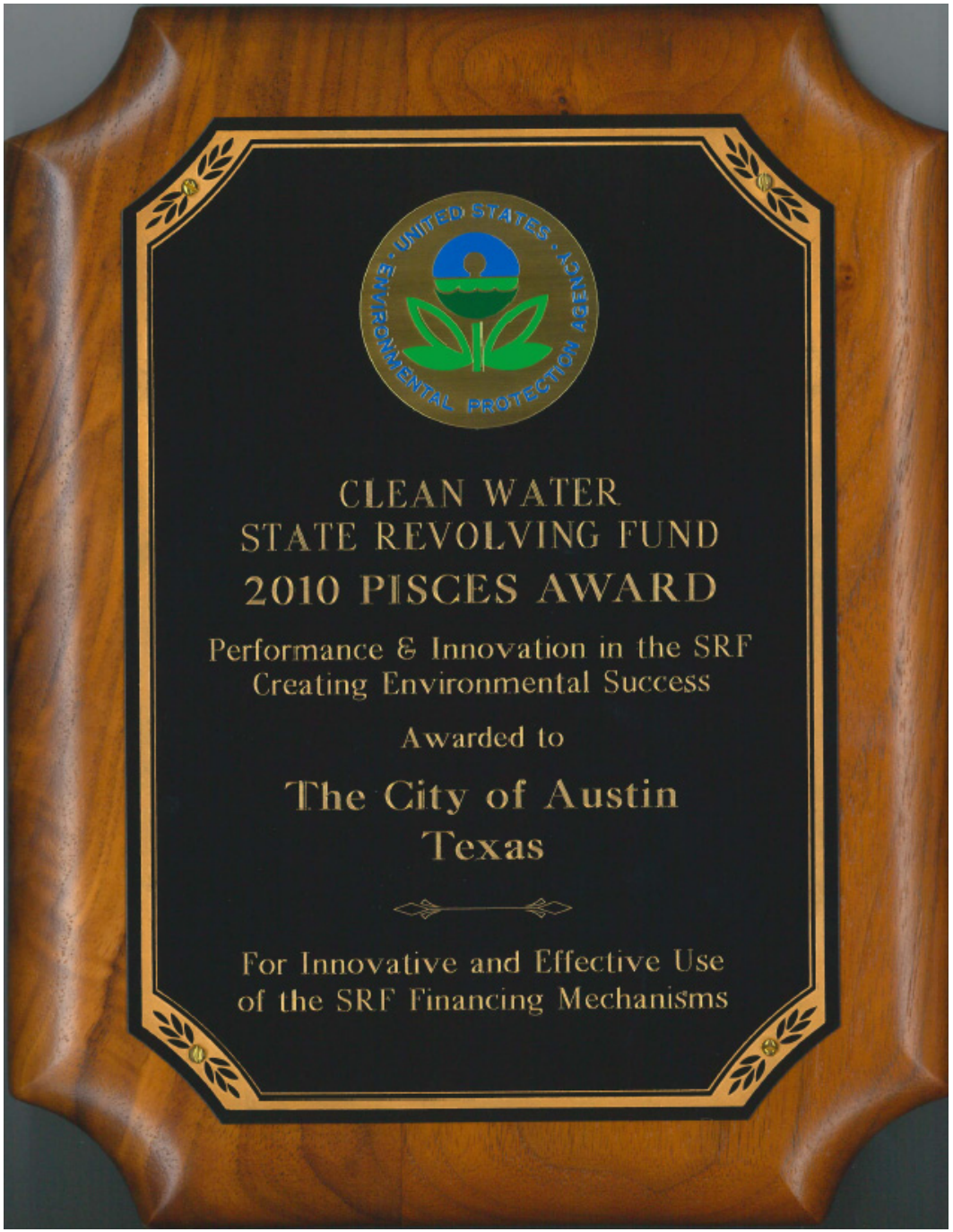
Benefits of Stimulus Fund Projects

(continued…)

- 6,500 tons of CO_2 equivalent GHG reduction by 2012
- 55% increase in energy production by 2012
- 1.75 MW electricity from a related biogas generator project – $1.2 million grant from U.S. Dept. of Energy through Austin Energy
- Waste heat from generators for heating digesters and other uses
- Generate enough electricity for Hornsby Bend

Combined Heat and Power from Methane

- 875 KW electricity from a biogas generator
- Waste heat from generators for heating digesters and other uses
- Hornsby Bend energy neutral
- Excess electricity goes to the grid



Clean Water State Revolving Fund 2010 PISCES Award

Performance & Innovation in the SRF Creating Environmental Success

Awarded to

The City of Austin Texas

For Innovative and Effective Use of the SRF Financing Mechanisms

Future Upgrades at Hornsby Bend

- Increase biogas production by anaerobically digesting:
  - Fats, oils and grease
  - Food wastes
- Increase CHP capacity
- Sidestream Treatment
- 100% Class A Biosolids
- Nutrient Recovery
  - Phosphorus recovery for fertilizers
- Solar Energy Farm

Questions, Comments?

Tom Toro, *The New Yorker*, May 12, 2012